

Appl. No. 10/551,728  
Response dated September 17, 2007  
Reply to Office Action of May 9, 2007

### **REMARKS/ARGUMENTS**

Claims 1-16 and 31 are pending. Claims 1-10, 12-16 and 31 have been rejected. Claim 11 has been objected to, because it depends from a rejected claim. Claims 17 - 30 have been withdrawn as per the restriction requirement and are hereby cancelled. New Claims 32-34 have been added. Support for the amended and new Claims are as follows:

<u>Claim</u>	<u>Support</u>
1	Original Claim 1; page 7, lines 19 and 20; and page 9, lines 5-7
2	page 9, lines 8 and 9
3	page 9, line 10
5	page 9, lines 10 and 11
6	Original Claim 1 and page 10, lines 10-15
7	Only changes claim dependency
8	Claims 1 and 8 and page 7, lines 19 and 20
9	Only changes claim dependency
10	Page 10, lines 10 and 11
11	Original Claims 1 and 11
12	Original Claim 1; page 7, lines 19 and 20; and page 11, lines 10-15
13	page 11, lines 14 and 15
14	page 9, lines 6-8
15	page 9, line 9
16	page 9, line 10
31	page 9, line 10
32	page 9, line 11
33	Original Claims 1 and 31; page 7, lines 19 and 20; and page 5, lines 8-12.
34	Page 4, lines 30-34 and page 5, lines 4-7

### **Information Disclosure Statement:**

The Office Action indicates that the information disclosure statement (IDS) fails to comply with the provisions of 37 CFR 1.97, 1.98 and MPEP §609. Applicants, after reviewing the IDS in Public Pair at the USPTO's web site, observed that the IDS was split in two pages and that all of the US patents penciled in on one

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sheet of the IDS were properly presented and initialed by the Examiner on the other separate IDS sheet. Thus, the hand written US patents were properly cited on a separate IDS sheet and, as such, the IDS was sufficient, in compliance and the art properly considered. During the interview of September 14, 2007, the Examiners indicated that the cited references were considered and that it was only a clerical mishap.

**Election/Restrictions**

Applicants have hereby cancelled all non-elected claims (17-30).

**The §102(b) Rejection:**

Claims 1-6, 8-10, and 12-16 have been rejected under 35 U.S.C. §102(b) as being anticipated by Wallin et al., U.S. Pat. Appl. No. 2001/0038810 ("Wallin" herein).

**Amended Claim 1:**

In summary, the Office Action appears to argue, regarding Claim 1, that Wallin describes, in essence, the incorporated catalysts described in paragraphs 31 and 32 may be incorporated into an acicular mullite by mixing precursor mullite compounds with precursor catalyst compounds and heated under, for example, an SiF<sub>4</sub> atmosphere [paras. 43-48], where one or more of the catalyst elements of Wallin are the same as the property enhancing elements in the present invention.

As amended, Claim 1 now requires that the Al/Si ratio of the mixture is less than 3.1. Wallin fails to describe this Al/Si ratio. Wallin only describes a ratio of 3.15 in para. 58. Thus, Claim 1 is novel. Wallin does not describe improved properties, particularly improved thermal shock behavior, of any mullite composition by inclusion of the claimed property enhancing elements in conjunction with the aforementioned Al/Si ratio. Since Wallin is silent on any improved properties of a porous mullite useful for Diesel particulate filters using the claimed property enhancing elements and mullite having a lower Al/Si ratio, the method of Claim 1 is also non-obvious. Consequently, Claim 1 and Claims dependent therefrom are patentable.

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*Amended Claim 8:*

Amended Claim 8 rewrites Claim 8 in independent form incorporating all of the elements of Original Claim 1 and Claim 8.

The Office Action in support of its position on novelty of Claims 8 and 9 states, "[r]egarding claims 8 and 9, Wallin et al. Disclose that in a preferred catalyst a metal element such as Ce, La, Ca, and even iron and scandium or a combination is incorporated into the catalyst coating ([0031], [0032])." It appears the Office Action is paraphrasing a sentence from para. 32, which reads, "[f]or example, an element may be Ce, Zr, La, Mg, Ca, a metal element described in the previous paragraph or combinations thereof." Wallin also states, that "[t]he catalyst is bound or incorporated into at least a portion of the ceramic grains when there is enough catalyst for the particular application." (para. 36) From the above, Wallin suggests that combinations of elements to catalyze exhaust gases or soot may be used, but Wallin, fails to describe any particular combinations of catalyst elements that are useful for that purpose. That is the combinations may be any combination within the Markush group and no particular ones are described.

In contrast amended Claim 8 requires that a first property enhancing compound containing an element that is Ce, B, Fe or Nd mixed and combined with a second property enhancing compound having a different element that is Mg, Ca, Pr, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Y, Sc, La or combination thereof. Thus Claim 8 is novel in that Wallin fails to describe any particular combination of elements useful for a catalyst or for any other reason. Claim 8 is also non-obvious, because Wallin fails to describe that any combinations of particular elements are beneficial in making a porous mullite composition with surprisingly improved properties such as greater thermal shock resistance as in the present invention. Consequently, Claim 8 and Claims dependent therefrom are patentable.

*Amended Claim 12:*

Amended Claim 12 is an independent claim incorporating all the elements of original Claim 1 and adds that the mullite is porous (40% to 85% porous) and that the property enhancing compound is added "in amount of at most about 5% by volume of the mixture." To reiterate, Wallin fails to describe any amount of

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catalyst other than to say that the amount of catalyst is an amount sufficient for a particular application. The catalyst may be incorporated or bound to the catalyst support grains (merely on the surface of the substrate grains). Thus, Wallin fails to describe any amount of catalyst that is incorporated into the substrate grains such as mullite grains. Since Claim 12 adds a limitation on the amount of the property enhancing compound that Wallin fails to describe, Claim 12 is novel. Claim 12 is also non-obvious, because Wallin fails to in any way describe that a small amount of the claimed elements when used to make the mullite results in surprisingly improved properties useful for a Diesel particulate filter such as improved thermal shock resistance. Consequently, Claim 12 and Claims dependent therefrom are patentable.

**The §103(a) Rejection (Wallin in view of Cutler):**

Claim 7 has been rejected under 35 U.S.C. §103(a) as being obvious over Wallin in view of Cutler et al., US Patent No. 6,227,382 ("Cutler" herein). Claim 6 has been amended to be an independent claim that incorporates all of the elements of original Claim 1 (plus adding that the mullite is "porous"), and the elements of original Claim 7.

The Office Action recognizes that Wallin fails to "disclose talc as one of the precursor compounds used to obtain the disclosed porous mullite." The Office Action cites Cutler to support the proposition that "it would have been obvious to a person of ordinary skill in the art to modify Wallin et al. in order to include talc as one of the precursor compounds used to produce the intended porous mullite as that taught by Cutler et al. motivated by the fact that Cutler et al. disclose that the ceramic material utilized to form porous filter elements resists dissolution or other deterioration upon prolonged exposure to water and the reference discloses the above combination (with the existence of talc) as the preferred mullite bodies which are made as described above [Wallin method]."

Applicants would agree if Cutler actually describe or teach that talc is a precursor for mullite, but Cutler does not. Cutler states:

These [cordierite or mullite] can be made by sintering or reaction sintering an extruded green honeycomb made of appropriate ceramic powders, for example, powder formulations comprised of mullite or mullite precursors such as silica and alumina or of cordierite or cordierite

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precursors such as kaolin clay, talc and alumina. (col. 6, lines 22-26)

It is clear from the above that talc, a magnesium silicate hydroxide  $[Mg_3Si_4O_{10}(OH)_2]$ , is only being referred to as a precursor of cordierite and the only mullite precursors are alumina ( $Al_2O_3$ ) and silica ( $SiO_2$ ). This only makes sense, since the chemical formula of mullite is  $3Al_2O_3 \cdot SiO_2$ , whereas the chemical formula for cordierite is  $2MgO \cdot 2Al_2O_3 \cdot 5SiO_2$ . That is, mullite is an aluminosilicate and not a magnesium aluminosilicate as cordierite is. Thus, Cutler merely describes well known precursors for mullite (silica and alumina) and cordierite (clay, "a hydrated aluminosilicate"; talc; and alumina). Thus, Cutler merely states that which is well known in the art: to make mullite one uses precursors containing Al, Si and oxygen and to make cordierite one uses precursors containing Al, Si, Mg and O. Since Cutler fails to describe the use of talc in small quantities to make an improved porous mullite composition by the method of amended Claim 6, Claim 6 is non-obvious and Claim 6 and Claims dependent therefrom are patentable.

**The §103(a) Rejection (Wallin in view of Tadayoshi):**

Claim 31 has been rejected under 35 U.S.C. §103(a) as being obvious over Wallin in view of Tadayoshi et al., JP pub. No. 01-172536 ("Tadayoshi" herein). New Claim 33 is written as an independent claim that incorporates all the elements of original Claims 1 and 31.

The Office Action recognizes that "Wallin et al., however, is silent to the use of both iron and magnesium in the claimed ratio in a mullite catalyst."

The Office Action, relying upon Tadayoshi, proposes that, "[it] would have been obvious to a person of ordinary skill in the art to modify Wallin et al. in order to include the ratio of Fe/Mg as that taught by Tadayoshi et al. motivated by the fact that Tadayoshi et al. disclose that the incorporation of metals in a porous ceramic body . . . as a continuous phase increases the strength of the ceramic." Applicants agree that a metal that fills the pores of a porous ceramic body will increase the strength of the resultant ceramic-metal composite, which is what Tadayoshi makes. (Claim 1 of the enclosed translation). This is irrelevant to the invention of new Claim 33.

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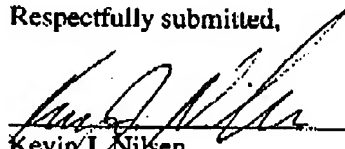
After filling in the pores, Tadayoshi forms a dense metal-ceramic composite having a metal phase and mullite phase. The ratio of Fe/Mg is only described for the aluminum metal alloy used to fill the pores of the mullite and not the mullite. That is, the Mg and Fe in Tadayoshi are metallic elements within the infiltrated aluminum alloy. Thus, Tadayoshi only describes Fe and Mg in the infiltrated aluminum alloy, but not in the mullite.

In contrast, Claim 33 claims a porous mullite composition having an Fe/Mg ratio of 1.5 to 0.5 by weight. The porosity of the mullite is from 40% to 85%. Claim 33 has also been amended to make it clear that the iron and magnesium are present as oxides in the mullite composition.

Since, Tadayoshi only describes a dense ceramic-metal composite (aluminum alloy infiltrated into the pores of a porous mullite) and fails to describe a mullite having Fe and Mg as oxides in the mullite to improve the mullite porous body (pores are not filled at all), Claim 33 and dependent Claim 34 are non-obvious.

Considering the foregoing reasons and amendments, Claims 1-16 and 31-34 are patentable. Applicants, therefore, respectfully request withdrawal of all rejections and allowance of Claims 1-16 and 31-34.

Respectfully submitted,

  
Kevin J. Nilsen  
Registration No. 41,510  
Phone: 248-391-6321

*Sept. 17, 2007*  
P. O. Box 1967  
Midland, MI 48641-1967  
KJN/can